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A DANGER
TO THE
PUBLIC HEALTH.

I.

LOCAL GOVERNMENT JOURNAL.

LONDON.

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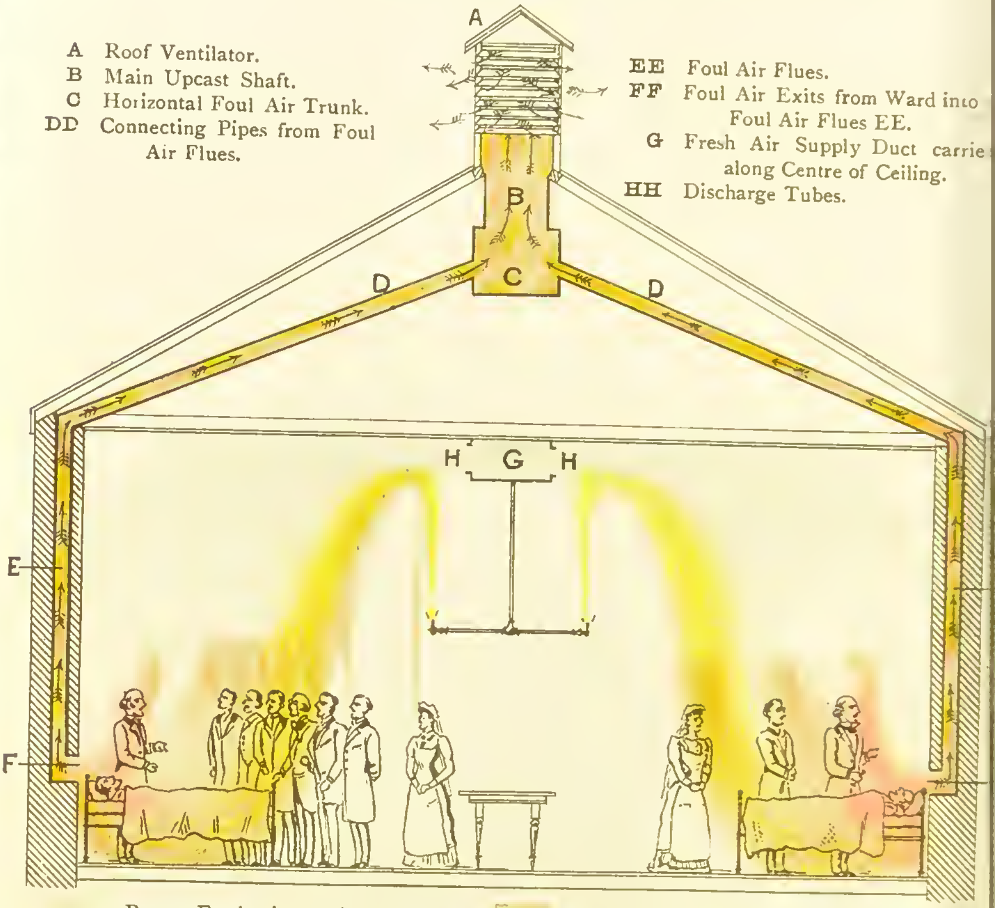
MECHANICAL VENTILATION ON THE DOWN DRAUGHT PRINCIPL BY IMPULSION, OR THE PLENUM SYSTEM, APPLIED TO A HOSPITAL WARD.

A Roof Ventilator.
B Main Upcast Shaft.
C Horizontal Foul Air Trunk.
DD Connecting Pipes from Foul Air Flues.

EE Foul Air Flues.
FF Foul Air Exits from Ward into Foul Air Flues EE.
G Fresh Air Supply Duct carrie along Centre of Ceiling.
HH Discharge Tubes.



🟦 BLUE—Fresh air supply.
🟨 YELLOW—Products of combustion.
🟫 BROWN—Products of respiration.
🟥 RED—Products of respiration from patient.

Downward ventilation returns the vitiated respired air to be rebreathed, also the poisonous products of combustion. Only an unendurable and highly dangerous down draught could prevent the hot respired air ascending to a height sufficient to ensure its rebreathal. With this system the patients in a hospital inhale foul air only. If the foul air exits are placed either above, below, or at the side of the bed, the results are the same, also when the fresh air is forced in at the upper parts of the side or end walls, or is projected up on to the ceiling.

A DANGER
TO THE
PUBLIC HEALTH.—I.

Reprinted from the

LOCAL GOVERNMENT JOURNAL,

SEPTEMBER 1ST, 1894.

"THE PROCEEDINGS at the recent Congress, held in London, of the British Institute of Public Health, has drawn attention to various sanitary questions in a way that must prove of incalculable value to the public health. It is satisfactory to note that the important —and to many vexed—question of ventilation was fully 'ventilated' by architects and sanitarians qualified to express decided opinions on the merits of different methods of ventilation.

"It is significant that the advantages of 'natural' ventilation, as it is now effected, over mechanical and other methods, was generally advocated at the Congress, the opinions expressed in favour of it being practically unanimous.

DANGEROUS SYSTEMS.

"As the subject is one that concerns all, we propose to give a brief *résumé* and review of its more recent developments, with special reference to the dangers of certain systems, as described in recently published reports, &c.

"In an instructive paper read at the Congress, Mr. T. B. Hall, F.R.I.B.A., referring to the ventilation of hospitals, stated: 'It said much for natural ventilation that the duration of a scarlet fever case could be shortened by its employment some six or seven days.'

THE PLENUM SYSTEM A FAILURE.

"This statement is endorsed by reports from a number of hospitals to the effect that natural ventilation was adopted with entirely satisfactory results after unsuccessful trials had been made with mechanical and other artificial systems, chiefly on the plenum or impulsion principle, forcing air in by fans.

METHOD OF VENTILATION APPROVED BY THE LOCAL GOVERNMENT BOARD.

"The Metropolitan Asylums Board, advised by scientific experts of the highest standing, including Sir Douglas Galton, F.R.S., employ a natural system of ventilation by automatic extraction from the ceiling, and admission of air from below—the plan approved by the Local Government Board—for their hospitals with, judging from the recorded results of official tests, the most complete success. The purity and freshness of the air in the wards, especially in the more recent hospitals, is remarkable, there being an entire absence of 'hospital smell,' one of the best tests of the efficiency of the ventilation.

FRESH AIR SCREENED AND PURIFIED.

"The fresh air supply is screened and purified and the temperature can be regulated as required. No fog or other impurities in the external air ever find access to the wards, the atmosphere of which is perfectly clear and bright even during a dense fog.

"The large hospital at present being erected by the Board at Shooter's Hill, at a cost of over

£200,000, is being ventilated on the 'natural' principle, as is also the hospital to be erected at Tooting.

AN EXTRAORDINARY SYSTEM.

" In connection with the competition for this hospital, we cannot refrain from recording that one of the competitors is the architect for the Birmingham New Hospital, for which building he has adopted a system of ventilation which, to say the least of it, is the most extraordinary that has, as yet, come under our notice.

A SHOWER BATH.

" It is proposed to mechanically propel the air supply through ducts carried along the centre of ceilings, from which it is projected and descends in the form of a shower bath on to the patients, and passes away through foul air exits placed at *the head of each bed.*

VITIATED AND DISEASE-LADEN AIR.

" Yes, it is quite correct; there is no mistake—placed at the *head* of each bed, so that the unfortunate patients will not only be subjected to a continuous down-current of air, but will also get the full benefit of all the vitiated and disease-laden air within their vicinity as it passes over their faces in a concentrated form on its way to the foul air exits placed at their *heads*.

"If we had not actually read the description of this system given by the architect himself, we would have hesitated to believe that in this the nineteenth century, and with all our boasted progress in sanitary science, such a scheme could ever even have been thought of, much less adopted.

THE REDUCTIO AD ABSURDUM OF VENTILATION.

"Surely this is the *reductio ad absurdum* of ventilation!

"The architect's description of the action of this system is, if anything, as pointed out in the columns of *The Builder* by the expert who prepared the recent report on the failure of the Mechanical Ventilation of the Houses of Parliament, even more remarkable than the system itself. 'I cannot conceive,' says the expert, 'how anyone possessing the most elementary knowledge of ventilation could pen the following sentence: "And to provide outlets, therefrom, in such positions and so conceived that the air may, after being vitiated, quickly pass away without being obstructed or accelerated by movement of the outer atmosphere or any other influence."

AN ABSURDITY.

"'The supposition conveyed in the latter part of this paragraph, that air inside a building, under certain, or even any, outside atmospheric conditions can "quickly pass away" without "being accelerated" by any influence whatever is to my mind an absurdity. So long as architects hold such views, so long will our public buildings stand every chance of being examples of inefficient and defective ventilation.'

A GREATER ABSURDITY.

"A greater absurdity as it appears to us, is not merely the statement made by the architect that with the system in question the vitiated air will quickly pass away without being accelerated by any influence whatever, but the fact that he provides, in direct opposition to this assertion, a powerful fan for the express purpose of driving the fresh air in and the foul air *out*.

A DANGER TO THE PUBLIC HEALTH.

"Should this scheme, which we have no hesitation in denouncing as a danger to the public health, ever be applied, the results will be watched with interest.

DISADVANTAGES OF MECHANICAL VENTILATION.

"In that monumental work, 'Hospitals and Asylums of the World,' the author, Mr. Henry C. Burdett, who is recognised as the highest authority in this country on hospital construction and ventilation, the disadvantages of mechanical and other forms of artificial ventilation are pointed out; and the instances given of their complete failure where employed, after the expenditure of enormous sums of money, are more than sufficient to make anyone contemplating a similar expenditure pause and reflect upon Mr. Burdett's caution that

COSTLY VENTILATION.

"'The really important point to be kept in view in regard to ventilation is, that before any system depending upon mechanical contrivances can be pronounced worthy of adoption, it must be demonstrated beyond dispute that it is not only as good as ordinary methods, but appreciably better. For nothing but a substantial improvement would justify the largely increased cost, both of construction and maintenance, necessarily consequent on the adoption of mechanical ventilation.'

EFFICIENCY OF NATURAL VENTILATION.

"The instances mentioned by Mr. Burdett of the success of natural ventilation are as remarkable as those of the failure of mechanical arrangements, which were found to do anything but verify the confident assertions of their devisers that they would prove completely satisfactory and more successful than other mechanical systems which, according to them, owed their failure to their defective construction and unskilful application. It would be instructive to know how they, with their alleged more perfect appliances and correct application, accounted for their own failures.

DANGERS OF MECHANICAL VENTILATION.

"The *Building News*, in an article on the dangers of mechanical ventilation, speaks thus of the down-draught principle:—

"'The evils described are accentuated when it is attempted to deliver air into a building at the higher levels—that is, to create a continuous *down-draught*—and to expel it at the floor line; but this method is seldom employed, though from time to time it is advocated in some form or other.

UNIVERSALLY CONDEMNED.

"'It is universally condemned by scientific authorities as most pernicious, contrary to the laws of Nature, and—from causes which are well known—fatal to health, insidiously sowing the seeds of disease.

DILUTED FOUL AIR.

"'With all down-draught systems diluted foul air only is breathed, never fresh, pure air, as the respired and exhausted air first, owing to its greater levity, ascends, and is returned by the downward current to the breathing level, mixed with the products of combustion, and is there reinhaled.

AN UNENDURABLE DOWN-DRAUGHT.

" 'Only a very strong and what would be an unendurable down-draught could prevent the highly rarefied respired air from rising to at least a height sufficient to ensure its rebreathal.'

" The breath from a fever patient being of a higher temperature than that of a person in ordinary health, ascends to a greater height, before being pressed down by the descending current, and is inhaled by those who may be close to the bedside, owing to the spreading and consequent diffusion that takes place. Where the current is upwards, as in natural ventilation, the breath from the patient ascends in an unbroken column, and is immediately drawn away without coming into contact with anyone.

EXHAUSTED AIR REBREATHED.

" With a down-draught system, no matter where the foul air exit openings are placed, above the bed, below the bed, or at either side of the bed, or if the fresh air is forced in at the walls instead of at the centre of the ceiling, the patient must inevitably rebreathe a considerable portion of not only his own exhausted air, but also a certain proportion of that of the patients on each side of him, and of persons standing about his bed.

A DANGEROUS SOURCE OF INFECTION.

"The watery vapour of his breath, in which the disease germs are suspended, is likewise precipitated on to the bedclothing by the downward current, and there accumulating, proves, not only a means of considerably retarding his recovery, if it is not indeed the actual cause of his death, but is a dangerous source of infection to others.

A POISONED AIR SUPPLY.

" One would imagine, who did not know the natural perversity of human nature, that it would be apparent to the dullest intellect that the exhausted and disease-laden air should be directed *away* from the patient, not *towards* and over him, and that the fresh air supply should be delivered to him direct and uncontaminated from the nearest source, not after it had traversed the height of the ward and become impregnated with impurities arising from other patients and those moving about the ward, which, with the system in question, is quite unavoidable.

A MISLEADING FEATURE.

" A very misleading feature about this particular system is the fact that the nurses, the doctors, and visitors, owing to their isolation, distance from the foul air exits, and higher breathing level, inhale comparatively pure air, and thus may easily form a wholly erroneous impression as to the general efficiency of the ventilation, and of the benefits derived from it by the patients.

AIR ANALVSES UNRELIABLE.

" Analyses of the air of a hospital ventilated on this principle, unless the air is taken from within the breathing zone of the patient, that is, close to the foul air exit—and what guarantee is there that this is ever done?—would be a farce and wholly misleading.

EVILS OF DOWN-DRAUGHT VENTILATION.

" No amount of air forced on this plan into a building could make the ventilation either efficient or safe. On the contrary, the danger would be augmented owing to the increased draught and the blockage of the foul air channels.

AN INDICTABLE OFFENCE.

"A well-known authority says, 'The evils of down-draught ventilation cannot be exaggerated, and the employment of it ought, in the interests of the public health, to be made an indictable offence.' In a published letter to the expert who reported on the ventilation of the Houses of Parliament an eminent architect and scientist says, 'I have before now tried (very much in vain) to drive the idea into people's heads that one can pass an ample supply of fresh air through an apartment without ventilating it.' An equally high authority states, 'Engine driving columns of air through a building is not ventilating it.'

TABLES OF AIR SUPPLY ILLUSORY.

"Wonderful results may be shown in the way of tables of cubic feet of air propelled into a building, but they are illusory as in any way indicating the efficiency of the ventilation.

A CONDEMNED SYSTEM.

"In a Government report on ventilation laid before the United States Congress downward ventilation is emphatically condemned. Clause 3 of the report states :—‘In large rooms an enormous quantity of air must be introduced in the downward method if the occupants are to breathe pure, fresh air, or about *three times the amount* which is found to give satisfactory results with the upward method.’

UPWARD VENTILATION BY EXTRACTION RECOMMENDED.

“‘For these and other reasons the Board are of opinion that the upward method should be preferred.’

THE MOST DANGEROUS FORM OF VENTILATION.

“No statements in favour of the down-draught system, emanating from those having a personal interest in it, or who advocate it, or who may be responsible for its adoption in any building, and who, therefore, would naturally uphold it, would in the slightest degree alter our opinions regarding it, as it condemns itself on every point; and the highest authorities, both in this country and America, where the system originated, denounce it as the most dangerous form of ventilation that could be applied to a building.”

(*To be continued.*)